WHAT IS CLAIMED IS:

1. A simulation apparatus for simulating, based on design information of a design model designed in a virtual three-dimensional space while one or more standard part models standardized in advance based on a specification model are arranged in the design model, working for the standard part models arranged in the design model, comprising:

a working means model information storage section for storing information regarding a working means model related to one or more standard part models for working the standard part models;

a working means model information extraction section for referring, based on information regarding the standard part models arranged in a design model, to said working means model information storage section to extract information regarding a working means model to be used to work the standard part models arranged in the design model; and

a working simulation execution section for executing a simulation of the working for the standard part models with the working means model based on design information of the design model and the information regarding the working means model extracted by said working means model information extraction section.

2. A simulation apparatus as claimed in claim 1,

wherein the information regarding the standard part models arranged in the design model include attribute information of the working means model related to the standard part models, and said working means model

5 information extraction section refers to said working means model information storage section based on the attribute information to extract the information regarding the working means model.

10 3. A simulation apparatus as claimed in claim 1, wherein said working means model information storage section stores information of one or more tool models which are models of actual tools and/or a hand model which is a model of a hand of a worker as the information

15 regarding the working means model.

4. A simulation apparatus as claimed in claim 1, wherein the information regarding the working means model stored in said working means model information storage

20 section includes reference position information of the working means model when the working means model works the standard part models while the design information of the design model includes reference position information of the standard part models when the working means model

25 works the standard part models, and said working simulation execution section performs a simulation of a relationship in position/posture of the working means

model to the standard part models based on the reference position information of the working means model and the standard part models.

5. A simulation apparatus as claimed in claim 1, further comprising an interference checking section for checking interference of the working means model while said working simulation execution section executes a simulation of the working for the standard part models with the working means model.

6. A simulation apparatus as claimed in claim 5, wherein said interference checking section checks interference of the working means model including a route along which the working means model arrives at one of the standard part models when the standard part model arranged in the design model is worked using the working means model.

7. A simulation apparatus as claimed in claim 2, further comprising a workability evaluation coefficient storage section for storing, for the working means model included in the same attribute, a workability evaluation coefficient which makes a reference for evaluation of a workability of the working means model, and a workability evaluation section for evaluating the workability based on a result of execution of the working simulation by said

working simulation execution section and the workability ~~evaluation coefficient~~ stored in said workability evaluation coefficient storage section.

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8. A simulation apparatus as claimed in claim 1, wherein said working means model information storage section stores information regarding a working condition necessary for working for the working means model as information regarding the working means model, and said

10 working simulation execution section executes a working simulation based on the information regarding the working condition of the corresponding working means model stored in said working means model information storage section.

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9. A simulation apparatus as claimed in claim 8, wherein said working means model information storage section stores information regarding working spaces necessary for working with the working means model as the information regarding the working conditions of the

20 individual working means model.

10. A simulation apparatus as claimed in claim 4, wherein said working means model information storage section stores information of a plurality of reference

25 positions for any working means model which allows operation thereof in a plurality of different methods, and said working simulation execution section executes

a working simulation according to the plurality of operation methods.

11. A simulation apparatus as claimed in claim 7, wherein said working means model information storage section stores information of a plurality of reference positions for any working means model which allows operation thereof in a plurality of different methods and said working simulation execution section executes a working simulation according to the plurality of operation methods while said workability evaluation coefficient storage section stores a workability evaluation coefficient which makes a reference for evaluation of a workability for each of the operation methods of the working means model, and said workability evaluation section evaluates the workability of the working means model for the each of the working methods based on a result of execution of the working simulation according to the working method and the workability evaluation coefficient stored for the operation method of the working means model in said workability evaluation coefficient storage section.

12. A simulation apparatus as claimed in claim 1, wherein at least one of a fastening part model, an adjustment part model and a connector part model is used for the standard part models.

13. A simulation method for simulating, based on data regarding a design model displayed in a virtual three-dimensional space and designed while one or more

5   standard part models standardized in advance based on a specification model are arranged in the design model, workability according to a working means model used to work the standard part models arranged in the design model, comprising the steps of:

10   relating a working means model to one or more standard part models;

acquiring the working means model related to the standard part models used upon designing of a design model;

15   executing a simulation of working to be performed for the standard part models using the acquired working means model; and

displaying a process of the execution of the simulation in a virtual three-dimensional space.

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14. A simulation method as claimed in claim 13, wherein, as the simulation of the working to be performed for the standard part models, a simulation of at least one kind of working from among assembling working,

25   disassembling working, adjustment working and maintenance working for the standard part models is performed.

15. A simulation method as claimed in claim 13, wherein, where a tool is used to work the standard part models, the tool and a hand of a worker who uses the tool are used as the working means model to perform the

5 simulation of the working.

16. A simulation method as claimed in claim 13, wherein, where the standard part models are to be worked by a hand of a worker itself, the hand of the worker is

10 used as the working means model to perform the simulation of the working.

17. A simulation method as claimed in claim 15, wherein, when the process of execution of the simulation

15 of the working is displayed in the virtual three-dimensional space, the working means model is displayed in a shape suitable for an object of use in the virtual three-dimensional space.

20 18. A simulation method as claimed in claim 16, wherein, when the process of execution of the simulation of the working is displayed in the virtual three-dimensional space, the working means model is displayed in a shape suitable for an object of use in the virtual

25 three-dimensional space.

19. A simulation method as claimed in claim 13,

wherein a process through which the working means model arrives at one of the standard part models which provides a subject position and a manner of working performed based on a condition defined in advance for the working means

5   model are displayed as the process of execution of the simulation of the working.

20.   A simulation method as claimed in claim 19, wherein, after the working performed based on the

10   condition defined in advance for the working means model is completed, a process through which the working means model is spaced away from the subject position based on a condition defined in advance for the standard part models is displayed, and after the working means model

15   is spaced by a predefined distance away from the subject position, the display of the working means model or the working means model and the standard part models is erased.

20   21.   A simulation method as claimed in claim 13, wherein, when interference occurs with the working means model in a process of execution of the working to be performed for the standard part models with the working means model, an occurrence condition of the interference

25   is displayed.

22.   A computer-readable recording ~~medium having a~~

simulation program recorded thereon for causing, in order to cause a computer to execute, based on design information of a design model designed in a virtual three-dimensional space while one or more standardized

5 standard part models are arranged in the design model, a simulation of working with a working means model used to work the standard part models arranged in the design model, the computer to implement:

a function of acquiring information regarding a

10 working means model related to one or more standard part models used upon designing of a design model;

a function of executing a simulation of working to be performed for the standard part models based on the acquired information of the working means model; and

15 a function of displaying a process of the execution of the simulation in a virtual three-dimensional space.

23. A designing supporting apparatus, comprising:

a standard part model information storage section

20 for storing information regarding one or more standard part models standardized in advance based on a predetermined specification model; and

a designing supporting section for arranging one or more standard part models to perform supporting for

25 designing a subject in a virtual three-dimensional space;

said designing supporting means including an attribute information extraction section for referring

to said standard part model information storage section
to extract attribute information of a working means model
to be used to work the standard part models arranged in
the subject designed in the virtual three-dimensional
space, and a design data outputting section for outputting
data regarding the subject designed in the virtual
three-dimensional space and data regarding the attribute
information extracted by said attribute information
extraction section as design data.